FIELD OBSERVATIONS ON THE DAILY ROUTINE AND SOCIAL BEHAVIOUR OF COMMON INDIAN MONKEYS, WITH SPECIAL REFERENCE TO THE BONNET MONKEY (*MACACA RADIATA* GEOFFROY)

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(*With a plate*)

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1. INTRODUCTION

In spite of the excellent opportunity for field observation of Indian monkeys, especially near temples and villages, very little is known and published of their habits and social behaviour. Contrarywise, there are exact observations on monkeys of other countries in the wild state, e.g., on howling monkeys (C. R. Carpenter 1934, N. Collias and Ch. Southwick 1952), on red spider monkeys (C. R. Carpenter 1935), on gibbons (C. R. Carpenter 1940), and on baboons (S. Zuckermann 1932). We therefore took the opportunity during our trip through India under the leadership of Prof. B. Rensch in spring 1953[1] to collect some more information about Indian monkeys. We had particularly good facilities for observation at Byrankuppe, about 45 miles south of Mysore City, where two troops of *Macaca radiata* lived close to our forest bungalow.

For kind help during our stay in India I wish to express my gratitude to Mr. Sálim Ali (Bombay) and to the Forest Departments of Mysore and other States of the Indian Union for permitting us to use the forest bungalows. Special thanks are due to Prof. B. Rensch, who gave me his field notes about Indian monkeys, and to the other members of our scientific party, Mrs. I. Rensch, Dr. K. W. Harde and Dr. R. Altevogt, for their co-operation.

2. The Bonnet Monkey, *Macaca radiata* Geoffroy

The Bonnet monkey is the geographical representative of the Rhesus, which lives northward of its area. So far as I know, there are no publish-

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ed field observations concerning this species. I studied two troops near Byrankuppe, Mysore (A. Nolte 1955). Observation was facilitated by the light terrain, a forest with little undergrowth in which bamboo clumps dominated. During our stay in Byrankuppe (in April 1953) I usually tried to find the monkeys at their sleeping places early in the morning, before dawn, and followed them for several hours till 10 or 11 o'clock; once till 14·00 o'clock. In the afternoon I looked for them again in their usual feeding places (fruit trees), and accompanied them to their sleeping trees.

Troop No. 1 consisted of 32 individuals and 2 babies, while there were 33 individuals and 5 babies in troop No. 2. There was a proportion of 1·6–1·7 adult females to one mature male. I got these data by noticing the sex and the probable age of the monkeys when they crossed a path or jumped from tree to tree (average of 6 observations). The adult males were easy to distinguish by their stouter build and larger size. A full-grown male weighs 13–19 lb., a female 7–8 lb. only (S. H. Prater 1948). But I had some difficulty in distinguishing the females from the younger males especially if they moved fast. The composition of the two troops was nearly as follows:

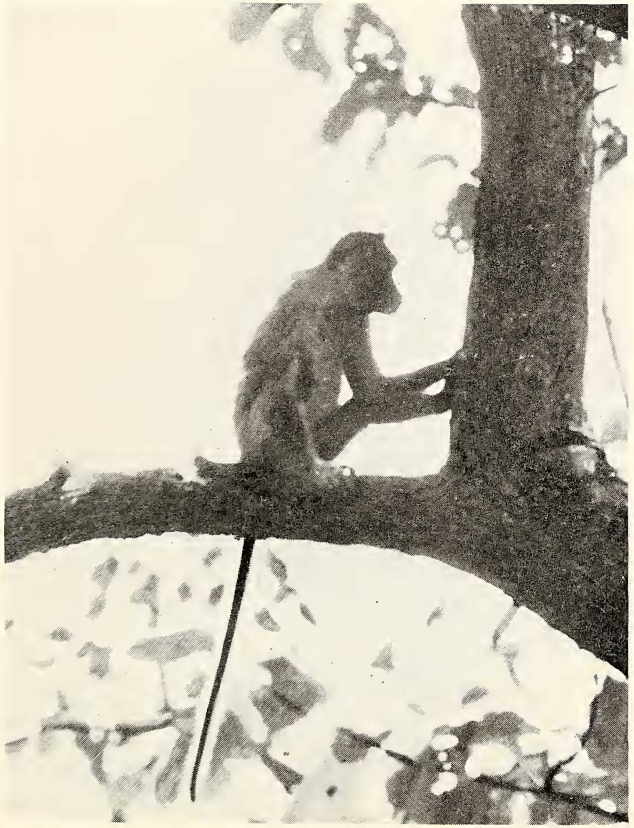
Troop	♂♂	♀♀	♀+	J	I	Total
1	3	5	(2)	17	7	32
2	5	8	(5)	12	8	33

(♀+ = females with babies; J = juveniles; I = infants).

Among the first three categories, leading the troop when on the move there were relatively more males. A similar fact was noticed by C. R. Carpenter (1934) in howling monkeys, but some years later N. Collias and Ch. Southwick (1952) found twice as many females in front of the same troops as males. It would be of interest to observe one troop over a prolonged period, perhaps with marked individuals, to see if and how often leadership may shift.

The daily movement took place within an area of about 1 square mile. But there was no evidence of defending this 'territory' against other troops. On several occasions, at different hours of the day, both troops were seen feeding on the same tree—and once troop No. 2 was observed spending the night right in the middle of the 'territory' of troop No. 1 and only about 125 yards apart from the sleeping tree of No. 1. Unfortunately, I never observed the moment when both troops met each other.

The monkeys used to sleep in the bamboo thicket at the edge of the Kabbani River, every night at different spots within a distance of 900-1200 yards (they spent only one night 250 yards away from the river in the forest). Average sleeping time during the night was about 11½ hours. The monkeys woke up early in the morning, about 6 o'clock, as soon as the luxmeter deflected a little. They began the daily routine with mutual grooming, defecation and urination. It was remarkable that during the first quarter of an hour they behaved very noiselessly. I never saw them feeding at their sleeping place. About 15 minutes after rising they suddenly went off to one of the fruit trees nearby, not always using the most direct way. Here they fed for 1—1½ hours, at last filling up their cheek pouches. The bonnet monkeys in Byrankuppe ate fruit (mangoes, wild figs, lantana berries), young shoots (especially of bamboo), buds, seeds and insects. After their early morning feed, the monkeys moved forward,



Photos *A. Nolte*

Macacs during the noonday siesta

mostly on the ground (also in dense teak thicket). Their speed was normally very slow. From time to time they used to rest in the shade, busy with mutual grooming, nursing babies, eating the contents of their cheek pouches, and looking for insects and seeds by turning over old dry bark or leaves. The young were mostly playing during this time. One day I spent a longer time with the troop No. 1 (till 14·00 o'clock). At about the half time between rising and going to sleep (11·30 till 12·50) there was a short siesta (not during the hottest daytime!). The monkeys were sitting on different trees in the shade, some in crotches, others lying on thicker branches. All members of the troop kept silent and quiet, even the young. Some of them shut their eyes and seemed to sleep. A similar nap was described by C. R. Carpenter for the howling monkeys (1934) between 11·00 and 14·00 o'clock, for gibbons (1940) between 11·30 and 15·00 o'clock.

Arriving at the sleeping place about 18·00 o'clock, the monkeys usually first went to the river to drink. They drank with the mouth from the water surface without using their hands. I never saw them drinking after rising in the morning, but sometimes during the day out of a small pool, or they put their hands into the water gathered in hollow stems of bamboo after a shower of rain and licked the droplets from their arms and fingers. In the evening, before the beginning of darkness, the monkeys sat near the sleeping place, ate shoots of bamboo or leaves, here and there and groomed each other. As soon as the night began they disappeared into the bamboo thicket and remained there quietly.

Mutual grooming occupied a considerable part of the day. Here no influence of dominance relations could be observed, as A. H. Maslow (1936) found among rhesus monkeys in the laboratory. Maslow put two monkeys, which had been separated some time before, together in a cage to find out which was the dominant animal, and whether the dominant individual would groom the subordinate one, or vice versa. No self-grooming was observed among bonnet monkeys in the wild state, but I have seen it among two individuals caged together in the Münster zoo.

In neither troop could I observe any real mating behaviour. This would agree with C. G. Hartman's finding (1931) that bonnet monkeys in zoological gardens did not conceive from March till July. Only one part of the mating behaviour, the mounting, could be seen by me several times, but this took place not only between the different sexes, but also between two males, two females or two juveniles. The active partner pulled the tail of the other monkey who looked back over its shoulder, but remained passive during the mounting that followed, which never lasted more than half a minute. Thereafter the two monkeys went their ways without taking any more notice of each other. Mounting without sexual significance has been described by C. R. Carpenter in the rhesus colony near Puerto Rico (1942), by A.H. Maslow (1936, dominance experiments), and by S. Zuckerman in *Hamadryas* (1932). The male position in mounting seems to be a part of the behaviour of a dominant animal.

During the first days of observation the babies of troop No. 1 were already able to move about independently among the branches. But at first the distance from their mothers remained about ½ a yard only. At this time the mothers were extremely attentive towards their babies. If there was any kind of alarm they rushed towards the babies and grasped them quickly. Some days later, they seemed to be less attentive and careful. They climbed away from their babies without looking after them

but came back at any tumult. The babies seemed to be more dependent on their mothers in that state. When left alone they cried violently and tried to follow their mothers. Concerning bonnet monkeys there is no information about the length of the dependence-phase of the babies on their mothers in the wild, so far as I know. I saw last year's juveniles leaning towards females and females grasping such young ones and trying to carry them without any alarm situation. But these juveniles were too heavy and they struggled to get away. It seems therefore that even after becoming independent some relationship between mother and baby persists for about one year.

The play of the juveniles occupied a great part of the day. Normally they used to play in flocks of four and more individuals. There was a sort of chase from tree to tree or on the ground, mostly ending with play-fighting. When highly excited, they sprang up into the air with all four legs, or they shook branches violently. Three times I saw such play-fighting end in a subordinate position of one partner: he pressed himself flat on a branch and crawled slowly backward to withdraw himself.

The routine behaviour of the bonnet monkeys was not disturbed by the roaming in their territory of domestic animals (fowls, goats, cows, sheep) tame elephants, and birds of different sizes. But dogs caused a panic flight to nearby trees or termite mounds. The monkeys never ran along the ground, when a dog had caused the flight. From their high position they chattered at the dog, bared their teeth and shook branches. Some time after the dog was out of sight they climbed down very cautiously. A jackal (*Canis aureus*), however, was put to flight by the joint attack of the whole troop on the ground. This social instinct of joint attack or joint flight is very strong. Once I saw the whole troop rushing off together (I could not discover the cause) while a helpless baby cried on a bamboo for its mother, whose mother-instincts were apparently not as strong as her social ones.

3. **The Rhesus Monkey**, *Macaca mulatta* (Zimmerman).

The rhesus is found throughout northern India as far as the Tapti River in the west and the Godavari in the east. We know very little about the exact number of individuals in the troops. There are smaller and larger groups. We are much better informed in regard to an artificial rhesus colony on a small island off the coast of Puerto Rico (C. R. Carpenter 1942). In 1938 about 400 rhesus monkeys from India were released there. Fifteen months later Carpenter found most of them organized in 6 heterosexual groups, ranging from 13 to 147 individuals (an average of about 70 animals per group). These data are not comparable with those in India because individuals of many troops were put together in a different environment. In addition Carpenter saw 12 sub-adult males living in unisexual groupings. Among the adults the proportion was six females to one male. A preponderance of females over males seems to be the rule in old and new world monkey troops (H. W. Nissen 1951, S. Zuckerman 1932).

In India we did not have an opportunity to observe rhesus troops for a sufficiently long time, but we never saw such large groups as Carpenter did in the artificial colony. At Kansrao (Siwalik Hills) there was one troop of about 17 individuals and another of 19. As there was no village nearby, the animals were rather shy, and when disturbed they disappeared into the dense underwood. So I could not determine the sex ratio.

There was no newborn baby with them (beginning of March), but some of the females were surely pregnant.

Whether there is a definite breeding season in rhesus monkeys or not, is not yet ascertained. Most observers believe that this is the case, but they do not agree with regard to the month, in which the babies are born. R. W. G. Hingston (1920) and W. Heape (1897, at Muttra) mentioned March as the main month of birth. In the rhesus colony of the Baltimore Zoological Garden most of the babies were born in March and April, but a few in the other months too (C. G. Hartman, 1931). In the colony near Puerto Rico, C. R. Carpenter found most newborns from June till August. In Simla W. Heape (1897) saw babies from August till September. On the basis of his own observations and of the information from the Calcutta Zoo, where the rhesus reproduced at any time of the year, he drew the conclusion that this species breeds at different times in different parts of India. We need more exact data about the breeding season all over India for deciding whether Heape is right, or perhaps S. H. Prater (1948) who mentions that the rhesus breeds at any time of the year.

About the behaviour of the babies and the maternal care there are many observations from laboratories and zoological gardens which need confirmation from the wild state (K. S. Lashley and J. B. Watson 1913, O. L. Tinklepaugh and C. G. Hartman 1932, J. B. Foley 1935, O. L. Tinklepaugh 1942 etc.). The gestation lasts about 6 months. One or two days after birth, the babies are already able to climb upward when frightened. The incisors are well out during the 15th week and then the molars begin to appear. The babies begin to unloose from their mothers after 9 weeks, but thereafter the mothers still take care of the young ones and carry them about at any tumult, sometimes for more than one year, even after the birth of a new baby (O. L. Tinklepaugh 1942).

The sexual behaviour has been studied by C. R. Carpenter (1942) in the colony near Puerto Rico. There is no harem system as among baboons. During the oestrous period (average of 9·2 days) the females are very aggressive to other females. Normally they turn over to the males. In this colony Carpenter found 2 pure male groups (one with 7 ♂♂, the other with 12 ♂♂). With the beginning of maturation the young males separate from the parent group and live in male troops until they reach the adult stage. Then they try to get into a heterosexual group where they normally have to begin with a low dominant rank.

4. The Common Langur, *Semnopithecus entellus* (Dufresne).

The langur or Hanuman monkey, one of the sacred animals of the Hindus, is often found near temples and villages or in the jungle. In spite of this fact there is scanty, partly contradictory information about the size of the troops, their composition as to males, females and young ones, and their social hierarchy. Langurs have been observed in troops of various composition. The largest assemblages were promiscuous ones. In the literature I do not find any exact numbers given. At Sikandra near Akbar's Tomb, we saw about 50 or more specimens; in the Western Himalayas near Chakrata a troop with about 50 individuals was seen. There was another troop near Kansrao (Siwalik Hills) consisting of 17 monkeys. In these large troops there are males and females of all ages together with young ones (see W. T. Blanford 1888–1891, T. Hutton 1867; S. H. Prater 1948). There is no conformity in the proportion of

males to females in such troops. Some observers saw one or two adult males only (T. C. Jerdon 1867, T. H. Hughes 1884). At Sikandra, one of the tomb *chaukidars* (guards) told us that there was one single very bold male (overlord) besides many younger males, females and young ones. It is a pity that we could not stay longer than an hour in Sikandra to get more exact information about this troop, which was half tame, being fed by the guards and visitors.

Besides these large promiscuous troops there are many reports of small groups of males (E. Blyth 1843; T. C. Jerdon 1867, S. H. Prater 1948), of lone males (W. T. Blanford 1888–1891), and of small family parties (W. T. Blanford, A. C. McMaster 1870). The animals in male groups are supposed to have been driven out of the harem on attaining maturity. T. H. Hughes (1884) reported a battle between a male troop and a promiscuous one. Three males chased the single overlord of the mixed group, while the other males tried to separate some females from the harem. It may be that new troops are founded in such a way. One of the disadvantages of extreme social grouping is the strong inbreeding. This would be avoided by separating males from the harem so that they can go over to other troops later, or can establish a family with a female taken from a heterosexual troop.

We saw small groups of langurs near Bhimashankar (W. Ghats) and Byrankuppe (Mysore). Most of them contained 4-5 individuals only. But we were not able to determine if they were family or male groups.

We also know very little about the size of the ' territory ' and about the daily routine of langurs. Apparently there exist distinct territories. We saw the same troops for several days in the same part of the forest, especially near Kansrao in the Siwalik Hills. And S. H. Prater (1948) noted that langurs return to the same roosting place every night. But there is no information as to how far they wander during the day and if they use the same feeding grounds day after day. Another question has still to be answered: Do the male groups have special territories, or do they move through the territories of the mixed troops? The same problem has to be solved for the small family troops.

During the hottest time of the day, the langurs were seen resting in the shade often near water courses (C. McCann, 1928; S. H. Prater 1948). When alarmed while running, they raise themselves to their full height to look around, and when sitting on the tops of the trees they will cleverly conceal themselves by grasping and drawing branches together, thus becoming completely hidden (C. McCann, 1928). If they are chased by dogs, they sometimes seem to lose their heads, and, although an aerial crossing from tree to tree may appear quite simple, they will often descend to the ground, where they run with great bounds (F. W. Champion 1928; S. H. Prater 1948). At Sikandra we observed the flight caused by a dog. The langurs were sitting on the ground so that we could feed them. They were grooming and playing when the barking of a dog caused the guttural alarm note of the male overlord. At once all monkeys climbed the nearby trees or house roofs.

5. Some problems which could easily be worked out in India

Our review shows that rather little is known about the natural life of Indian monkeys. For Indian zoologists it would perhaps not be too